TUNING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a tuning device for tuning a musical instrument, and in particular, to a display portion of the tuning device.

2. Description of the Related Art

Tuning devices for measuring a deviation between a fundamental frequency of a sound of a musical instrument, a music signal, or the like, and a reference frequency as a standard for comparison, which are provided with displaying means for displaying the deviation, are conventionally known (refer to JP 2000-243131 A, for example). Further, meters constructed by a needle indicator portion and a graduated scale portion, devices constructed by liquid crystal display elements, and the like, exist as the displaying means of the tuning device (refer to Japanese Utility Model Registration No. 3033255, for example).

When a meter constructed by a needle indicator portion and a graduated scale portion is used, light from an LED employed as an illuminating means diffuses and lights up the needle indicator portion and the graduated scale portion. However, expression can only be made by light of a single color when performing tuning in a dark location with this type of conventional method. Further,

there is a problem in that the behavior of the needle indicator is difficult to verify. Therefore, with conventional tuning devices, it is particularly difficult to satisfy the requirements for cases when quick and accurate tuning is sought in a dark location, such as on stage during a concert.

SUMMARY OF THE INVENTION

In view of those problems, an object of the present invention is to provide a tuning device with which it is possible to easily read a graduated scale of a display, and in which it is possible to easily verify the behavior of a needle indicator, even when tuning is performed in a dark location.

In order to achieve the aforementioned object, a tuning device of the present invention uses an LED as an illuminating means, the LED having energy that can cause a fluorescent coating to emit light. Further, the fluorescent coating is applied to a needle indicator portion or a graduated scale portion of the meter, or to both the needle indicator portion and the graduated scale portion of the meter, in the tuning device of the present invention. If the LED, which is disposed in the vicinity of the meter, illuminates the meter in the tuning device structured as described above, light from the LED itself lights up the meter. In addition, the energy of the LED can excite the fluorescent coating, and cause the fluorescent coating to emit light.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

Fig. 1 is a front elevational view of an embodiment of a tuning device in accordance with the present invention;

Fig. 2 is an embodiment of a meter of the tuning device of the present invention;

Fig. 3 is an embodiment of an LED having a light diffusing means provided in a lens portion; and

Fig. 4 is an embodiment of a meter to which a light diffusing means is provided.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments of the present invention are explained hereinafter based on the drawings.

Fig. 1 is a front elevational view of an embodiment of a tuning device in accordance with the present invention. In Fig. 1, a displaying means 12, an electric power source and mode setting switch 13, a pitch setting switch 14, an internal microphone 16 for picking up musical sounds, a speaker 17 for sound production of a selected reference tone, and the like are disposed in a front surface of a main body case 10. An input jack 15 for inputting musical sounds is provided in a main body side surface. The displaying means 12 has a needle indicator portion 2 and a graduated

scale portion 3. The displaying means 12 is a meter that is enclosed in a case made of a transparent resin, or the like, in order to make visual verification possible. Each switch is a push type switch or a sliding type switch.

To use the tuning device, the electric power source and mode switch 3 of the tuning device is operated first, to turn on the tuning device. A user selects a tuning mode from manual or sound by selecting a position of the electric power source and mode switch 3. In addition, the user selects which sound to perform tuning on by using the pitch setting switch 14. When musical instrument sounds are input from the input jack or the internal microphone, a cent deviation between the selected sound and the input sound is displayed in the meter.

An embodiment of the meter of the tuning device of the present invention is shown next in Fig. 2.

In Fig. 2, an LED 1 used as an illuminating means is disposed in a portion above the center of the meter 12. The LED 1 has energy that is capable of causing a fluorescent substance to emit light. The LED 1 emits near ultraviolet rays in the embodiments of the present invention. The LED 1 is disposed in the vicinity of the meter in Fig. 1. A fluorescent coating is applied to, or printed onto, the needle indicator portion 2 or the graduated scale portion 3. The needle indicator portion 2 may be made of a synthetic resin or the like, in which the fluorescent coating may be incorporated

instead of applied or printed. If the color of the fluorescent coating used on the graduated scale portion is different, then color variations can be provided when the LED emits light. For example, the needle indicator portion 2 may be orange, and the graduated scale portion 3 may be blue.

When the near ultraviolet rays are emitted from the LED 1 in this embodiment, the fluorescent coatings provided in the needle indicator portion 2 and in the graduated scale portion 3 emit light. It thus becomes possible to easily read the meter display, even in a dark location. LED emission angles may differ according to product. For example, when using an LED having a narrow emission angle in a meter having a structure like that of Fig. 2, light can only be emitted to a center portion of the meter, and the fluorescent coating can only partially emit light.

An embodiment of an LED having a light diffusing means provided in a lens portion 4 is shown in Fig. 3.

The LED shown in Fig. 3 structures the light diffusing means by finishing a surface of the lens portion 4 in the periphery of an LED lamp in a frosted glass state. It becomes possible to light up the entire meter even if an LED having a narrow emission angle is used, because the surface roughness of the surface is coarse, and light from the lamp is diffused. The light emitting means is not limited to this structure, and a plurality of grooves may also be formed in the surface of the lens.

The light diffusing means can also be provided in the outer circumference of the meter. An embodiment of a meter to which the light diffusing means is provided is shown in Fig. 4.

In Fig. 4, a knurl groove is cut around the entire circumference in a case portion outer circumference 11 of the meter 12. The near ultraviolet rays emitted form the LED 1 are diffused by the knurl groove, and the entire meter is illuminated. The light diffusing means of the meter is not limited to this method. Using frosted glass, or finishing a surface of the light diffusing means into a coarse state, can also be considered, similar to the case of the LED.

Provided that the light diffusing means is used, disposal of the LED 1 need not be in the portion above the center of the meter, as shown in Fig. 2. For example, disposing the LED 1 on a side surface of the meter, or irradiating from a lower surface can also be considered. It thus becomes possible to increase the degree of freedom in designing the tuning device, and miniaturization and cost savings become possible.

With a tuning device according to the present invention, as explained above, visibility can be increased when performing tuning in a dark location by using an LED having energy capable of causing a fluorescent material to emit light, and by using a needle indicator portion or a graduated scale portion to which a fluorescent coating is applied, in a meter. Further, as many variations as the number

of fluorescent coatings being used can be made by using a plurality of fluorescent coatings, and visibility effects can be obtained.